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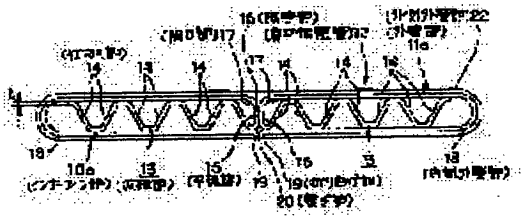
(54) FLAT HEAT TRANSFER TUBE FOR HEAT EXCHANGER

(57)Abstract:
PROBLEM TO BE SOLVED: To improve a heat transfer performance between a fluid flowing therein and a flat heat transfer tube while maintaining a corrosion resistance.
SOLUTION: The flat heat transfer tube 12 having an inner fin 10a and an outer wall 11a is integrally manufactured by folding one metal plate. The fin 10a is formed to have a thickness of that of the one metal plate, and the wall 11a is formed to have a thickness of that of the two plates. Thus, number of partitions 14 of wavy plates 13 for constituting the fin 10a is increased, thereby increasing a heat transfer area between the tube 12 and the fluid flowing therein.



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CLAIMS

[Claim(s)]
[Claim 1] It is building to one by bending and forming the metal plate of one sheet. The flat tubing-like outer wall section, While piling up the front faces of the above-mentioned metal plate mutually and making the above-mentioned outer wall section into the board thickness for these two metal plates at least in the flat heat exhanger tube for heat exchangers which consists of the inner fin section of the shape of a corrugated plate which exists inside this outer wall section The flat heat exhanger tube for heat exchangers characterized by making the above-mentioned inner fin section into the board thickness for the one above-mentioned metal plate.
[Claim 2] One pair of corrugated plate sections which the inner fin section is formed in the crosswise both-ends edge of the metal plate of one sheet in the shape of a corrugated plate, and have two or more partition sections, One pair of monotonous sections bent in the condition of making each end edge following the end edge of each [these] corrugated plate section, and on the other hand extending from the one side side of each [these] corrugated plate section towards a side to the cross direction of each [these] corrugated plate section in the almost right-angled direction, It has the septum section formed by [which will pile up mutually the side faces located in the opposite side of each above-mentioned corrugated plate section of the side faces of each / these / monotonous section, and will shine] attaching and joining. The outer wall section One pair of inside outer wall sections which made each end edge follow the other end edge of each above-mentioned monotonous section, bent the crosswise pars intermedia of the above-mentioned metal plate to the cross-section U typeface, and were formed so that each above-mentioned corrugated plate section might be wrapped, and openings which carried out opening to the method of one side were made to counter mutually, and have been arranged, One pair of bending sections which each end edge was made to follow the other end edge of each [these] inside outer wall section, turned the crosswise pars intermedia of the above-mentioned metal plate to the peripheral face side of each above-mentioned inside outer wall section, and were bent and laid on top of the cross-section U typeface, The connector section formed by comparing the periphery edges of the clinch section of each [these] bending section, and carrying out soldering junction mutually, The flat heat exhanger tube for heat exchangers which the both-ends edge is made to follow the other end edge of each above-mentioned bending section, respectively, and consists of the outside outer wall section of the shape of flat tubing which will lay on top of the peripheral face of each [these] inside outer wall section, and will shine in the condition of wrapping each above-mentioned inside outer wall section attached and joined and which was indicated to claim 1.
[Claim 3] The inner fin section is formed in the crosswise end edge of the metal plate of one sheet in the shape of a corrugated plate, and it consists of the corrugated plate section which has two or more partition sections. The outer wall section The inside outer wall section which has opening which that end edge was made to follow the end edge of the above-mentioned corrugated plate section, the crosswise pars intermedia of the above-mentioned metal plate was bent to the cross-section U typeface, and it was formed so that this corrugated plate section might be wrapped, and carried out opening to the method of one side, The flat heat exhanger tube for heat exchangers which consists of the outside outer wall section of the shape of flat

tubing which will lay on top of the peripheral face of this inside outer wall section, and will shine in the condition of wrapping the peripheral face of the above-mentioned inside outer wall section while making that end edge following the other end edge of this inside outer wall section and plugging up the above-mentioned opening attached and joined and which was indicated to claim 1.

[Claim 4] The first corrugated plate section which is formed in the crosswise end edge of the metal plate of one sheet in the shape of a corrugated plate, and has two or more partition sections, With first Taira Itabe bent in the condition of making that end edge following the end edge of this first corrugated plate section, and on the other hand extending from the one side side of this first corrugated plate section towards a side to the cross direction of this first corrugated plate section in the almost right-angled direction The inside outer wall section which has opening which that end edge was made to follow this first Taira Itabe's other end edge, the crosswise pars intermedia of the above-mentioned metal plate was bent to the cross-section U typeface, and it was formed so that the above-mentioned first corrugated plate section might be wrapped, and carried out opening to the method of one side, The flat part prepared in the condition of making that end edge following the other end edge of this inside outer wall section, and extending straightly from this other end edge, With secondary wave Itabe who continues the above-mentioned first corrugated plate section and crosswise [each], is stationed at a serial while making that end edge follow the other end edge of this flat part, and has two or more partition sections With second Taira Itabe bent in the condition of making that end edge following this secondary wave Itabe's other end edge, and on the other hand extending from this secondary wave Itabe's one side side towards a side to this secondary wave Itabe's cross direction in the almost right-angled direction

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] The flat heat exhanger tube for heat exchangers concerning this invention is related with amelioration of the flat heat exhanger tube which constitutes the heat exchanger used as a capacitor built for example, into the air conditioning system for automobiles.

[0002]
[Description of the Prior Art] As a capacitor which constitutes the air conditioning system for automobiles, the heat exchanger which constituted the core section with many fins and heat exhanger tubes is known. As shown in drawing 5 , this heat exchanger forms the entrance-side header 6 which has an inlet pipe 5, and the outlet side header 8 which has an outlet pipe 7 in the right-and-left both ends of the core section 3 which consists of the flat heat exhanger tubes 1 and 1 which have arranged each by turns horizontally covering the vertical direction, and the corrugated fins 2 and 2, and grows into them. Moreover, while aiming at reinforcement of this core section 3, the side supports 4 and 4 for using a heat exchanger for attaching in a car body are formed in the vertical both ends of the above-mentioned core section 3.
[0003] Fluids which are sent into the entrance-side header 6 from an inlet pipe 5, and flow the inside of the flat heat exhanger tube 1 and 1 at the time of use of such a heat exchanger, such as a refrigerant, are sent out from an outlet pipe 7 through the outlet side header 8, after carrying out heat exchange of between the flat heat exhanger tubes 1 and 1 which constitute the core section 3, and the corrugated fins 2 and 2 between the air which circulates in the direction of a front flesh side of drawing 5 and being cooled.
[0004] Moreover, in order to raise the engine performance of such a heat exchanger, while disturbing the flow of fluids, such as the above-mentioned flat heat exhanger tube 1 and a refrigerant which flows the inside of one, it is effective to increase the touch area of these fluid and flat heat exhanger tubes 1 and 1. Moreover, in order to secure the pressure resistance of each flat heat exhanger tubes 1 and 1, it is necessary to combine mutually one pair of monotonous sections parallel to each who constitutes each flat heat exhanger tubes 1 and 1 by two or more places. For this reason, an inner fin is inserted inside the flat heat exhanger tubes 1 and 1 which constitute the above-mentioned heat exchanger, and the structure which carries out soldering association is used for the inside of the one above-mentioned pair of monotonous sections from the former in this inner fin.
[0005] However, it is troublesome to combine later the inner fin built separately and a flat heat exhanger tube, and it becomes the cause which makes cost of a heat exchanger high. The structure which forms an inner fin and a flat heat exhanger tube in one as shown in a ****** No. 502811 [eight to] official report in view of such a situation drawing 6 -9 is indicated. Conventionally [this], flat heat exhanger tube 1a (drawing 9) of structure bends the plate 9 (clad plate which carried out the laminating of the wax material to at least one side) made from an aluminium alloy of one sheet by roll forming, forms, and changes. In building such flat heat exhanger tube 1a, it forms the corrugated plate section 13 as shown in drawing 6 in the crosswise (the direction of arrow-head b of drawing 6) both ends of this plate 9 by roll forming

first, sending the band-like plate 9 in the die-length direction (the direction of arrow-head a of drawing 6). If this corrugated plate section 13 is formed, subsequently to drawing 7 -8, the above-mentioned plate 9 is bent so that the above-mentioned corrugated plate section 13 may be wrapped inside, so that it may be shown. And by heating the above-mentioned plate 9 in the state of drawing 9 , soldering junction of each part which has contacted is carried out, and it is referred to as flat heat exhanger tube 1a which consists of the outer wall section 11 as shown in this drawing, and the inner fin section 10. In addition, this soldering is performed to soldering this flat heat exhanger tube 1a and other configuration members of a heat exchanger, and coincidence.

[0006]

[Problem(s) to be Solved by the Invention] In order to raise the engine performance of this flat heat exhanger tube 1a conventionally [as shown in drawing 9 mentioned above] in flat heat exhanger tube 1a of structure, it can consider making [many] the number of the partition sections 14 and 14 of the inner fin section 10, and making the heating area of this inner fin section 10 increase. However, although the heating area of this inner fin section 10 can be made to increase when board thickness of this inner fin section 10 is made thin and the number of each above-mentioned partition sections 14 and 14 is made [many] by making thin board thickness of the aluminum plate 9 which constitutes the above-mentioned inner fin section 10, the board thickness of the outer wall section 11 which constitutes the above-mentioned flat heat exhanger tube 1a also becomes thin. In this case, the corrosion resistance of the part to which the board thickness of the above-mentioned outer wall section 11 becomes thin, and this outer wall section 11 falls. Therefore, in the above-mentioned flat heat exhanger tube 1a, board thickness of the above-mentioned plate 9 cannot be made thin on the need of securing the board thickness of the above-mentioned outer wall section 11. The flat heat exhanger tube for heat exchangers of this invention is invented in view of the above situations.

[0007]

[Means for Solving the Problem] Like the flat heat exhanger tube for heat exchangers known from the former, by bending and forming the metal plate of one sheet, the flat heat exhanger tube for heat exchangers of this invention is built to one, and consists of the flat tubing-like outer wall section and the inner fin section of the shape of a corrugated plate which exists inside this outer wall section. While piling up the front faces of the above-mentioned metal plate mutually and making the above-mentioned outer wall section into the board thickness for these two metal plates at least in the flat heat exhanger tube for heat exchangers of this invention especially, the above-mentioned inner fin section is made into the board thickness for the one above-mentioned metal plate.

[0008]

[Function] In the case of the flat heat exhanger tube for heat exchangers of this invention constituted as mentioned above, the number of the partition sections which constitute this inner fin section can be increased by making only board thickness of the inner fin section thin, securing the board thickness of the above-mentioned outer wall section. Consequently, the heating area of this inner fin section increases, and the heat transfer engine performance can be raised, securing the endurance of the flat heat exhanger tube for heat exchangers of this invention.

[0009]

[Embodiment of the Invention] Drawing 1 shows the 1st example of the gestalt of the operation of this invention corresponding to claims 1-2. The basic structure of the flat heat exhanger tube 12 of this example is the same as structure conventionally which was mentioned above. Especially, in the case of the flat heat exhanger tube 12 of this example, the point which is considering board thickness of outer wall section 11a as two metal plates which constitute this outer wall section 11a differs from structure conventionally. then, the explanation which overlaps if the post of the part equivalent to structure mentioned above is taken conventionally -- an abbreviation -- or it is made simple and explains focusing on the description part of this invention hereafter.

[0010] The flat heat exhanger tube 12 of this example is a product made from an aluminium alloy,

by bending and forming in both sides of a core material the plate (metal plate) of one sheet which is double clad material which carries out the laminating of the wax material and changes, is built to one and consists of flat tubing-like outer wall section 11a and inner fin section 10a of the shape of a corrugated plate which exists inside this outer wall section 11a.
[0011] The above-mentioned inner fin section 10a is equipped with one pair of corrugated plate sections 13 and 13, one pair of monotonous sections 15 and 15, and the septum section 16. Each above-mentioned corrugated plate sections 13 and 13 are formed in the crosswise (longitudinal direction of drawing 4) both-ends edge of the metal plate of one sheet in the shape of a corrugated plate, and have two or more partition sections 14 and 14. The space of a batch where each [these] partition sections 14 and 14 exist inside the above-mentioned outer wall section 11a is in two or more ** long to the shaft orientations (the direction of a front flesh side of drawing 1) of the above-mentioned flat heat exhanger tube 12. Moreover, the part which each [these] partition section 14 and 14 comrades are made to follow dashes against the inner skin of the above-mentioned outer wall section 11a, respectively, and is carrying out soldering junction. in addition, the cross section which each [these] partition section 14 and 14 comrades are made for this part to follow smoothly although the part which each above-mentioned partition section 14 and 14 comrades are made to follow is constituted from an example of illustration in plate-like — also suppose that it is circular. Moreover, each above-mentioned monotonous sections 15 and 15 are the end edges (the case of the corrugated plate section 13 on the left-hand side of drawing 1 right end edge.) of each above-mentioned corrugated plate sections 13 and 13 about each end edge (lower limit edge of drawing 1). In the case of the right-hand side corrugated plate section 13, it is a left end edge. It is made to continue and is bent in the condition of on the other hand extending towards a side (top-face side of drawing 1) in the almost right-angled direction (above [of drawing 1]) to the cross direction (longitudinal direction of drawing 1) of each [these] corrugated plate sections 13 and 13 from the one side side (inferior-surface-of-tongue side of drawing 1) of each [these] corrugated plate sections 13 and 13. Moreover, the above-mentioned septum section 16 is formed by [which will pile up mutually the side faces located in the opposite side of each above-mentioned corrugated plate sections 13 and 13 of the side faces of each above-mentioned monotonous sections 15 and 15, and will shine] attaching and joining.
[0012] On the other hand, the above-mentioned outer wall section 11a consists of one pair of inside outer wall sections 18 and 18, one pair of bending sections 19 and 19, the connector section 20, and the flat tubing-like outside outer wall section 22. Each above-mentioned inside outer wall sections 18 and 18 make each end edge (edge which is drawing 1 and is located in the bottom) follow the other end edge (upper limit edge of drawing 1) of each above-mentioned monotonous sections 15 and 15. The crosswise pars intermedia of the above-mentioned metal plate is bent to a cross-section U typeface, and it is formed so that each above-mentioned corrugated plate sections 13 and 13 may be wrapped, and it is a method of one side (the case of the inside outer wall section 18 on the left-hand side of drawing 1 method of right-hand side.). In the case of the right-hand side inside outer wall section 18, it is a method of left-hand side. Opening 17 and 17 comrades which carried out opening were made to counter mutually, and are arranged. Moreover, each above-mentioned bending sections 19 and 19 made each end edge (edge which is drawing 1 and is located in the bottom) follow the other end edge (edge which is drawing 1 and is located in the bottom) of each [these] inside outer wall sections 18 and 18, and they are mutually piled up densely while turning the crosswise pars intermedia of the above-mentioned metal plate to the peripheral face side of each above-mentioned inside outer wall sections 18 and 18 and bending to a cross-section U typeface. Moreover, the above-mentioned connector section 20 is formed by comparing the periphery edges of the clinch section of each above-mentioned bending sections 19 and 19, and carrying out soldering junction mutually. Moreover, the above-mentioned outside outer wall section 22 makes the both-ends edge follow the other end edge (edge which is drawing 1 and is located in the bottom) of each above-mentioned bending sections 19 and 19, respectively, in the condition of wrapping each above-mentioned inside outer wall sections 18 and 18, is laid on top of the peripheral face of each [these] inside outer wall sections 18 and 18, and is carrying out soldering junction. Therefore,

the above-mentioned outer wall section 11a has the board thickness for the two above-mentioned metal plates. In addition, the flat heat exhanger tube 12 of this example makes board thickness t of the above-mentioned metal plate the abbreviation one half of the board thickness of the metal plate conventionally used for flat heat exhanger tube 1a of structure. Moreover, in case it is used building the flat heat exhanger tube 12 into a heat exchanger, the above-mentioned connector section 20 is located in the bottom. This reason is for making it hard to be in a condition [that dirt etc. adheres to the connector section 20 in which corrosion resistance is inferior compared with other parts, and this dirt etc. has become wet].

[0013] In manufacturing the flat heat exhanger tube 12 of this invention constituted as mentioned above, it forms the one above-mentioned pair of corrugated plate sections 13 in the crosswise both-ends edge of the metal plate of one sheet by roll forming. Thus, the flat heat exhanger tube 12 as shows the formed middle material 29 as shown in drawing 4 to drawing 1 by bending as shown in (a) - (e) of drawing 4 is manufactured. Roll forming performs the process shown in above-mentioned drawing 4 the same with forming each above-mentioned corrugated plate section 13. In addition, when heating soldering is carried out in the condition of having been bent as shown in drawing 4 (e), it is densely soldered between said each inside outer wall sections 18 and 18 and the outside outer wall section 22. Therefore, between these inside outer wall sections 18 and 18 and the outside outer wall section 22, gases, such as air with small thermal conductivity, do not invade.

[0014] Since inner fin section 10a has only the board thickness for the one above-mentioned metal plate in the case of the flat heat exhanger tube 12 of this example constituted as mentioned above, the board thickness of each above-mentioned partition sections 14 and 14 becomes abbreviation half [of structure] conventionally. Consequently, even when the number of each above-mentioned partition sections 14 and 14 is increased twice simply, the volume inside the above-mentioned outer wall section 11a is not different from the former. Therefore, the heating area of this flat heat exhanger tube 12 can be made to increase, maintaining the path of flowing fluid for the inside of the above-mentioned outer wall section 11a as usual.

[0015] Next, drawing 2 shows the 2nd example of the gestalt of the operation of this invention corresponding to claims 1 and 3. In flat heat exhanger tube 12a of this example, inner fin section 10b is formed in the crosswise end edge of the metal plate of one sheet in the shape of a corrugated plate, and consists of corrugated plate section 13a which has two or more partition sections 14 and 14. Moreover, outer wall section 11b consists of inside outer wall section 18a and flat tubing-like outside outer wall section 22a. The above-mentioned inside outer wall section 18a makes that end edge (edge which is drawing 2 and is located in the bottom) follow the end edge (right end edge of drawing 2) of the above-mentioned corrugated plate section 13a, the crosswise pars intermedia of the above-mentioned metal plate is bent to a cross-section U typeface, and it is formed so that this corrugated plate section 13a may be wrapped, and it has the opening 17 which carried out opening to the method of one side (the case of this example method of right-hand side of drawing 2). The above-mentioned outside outer wall section 22a makes that end edge follow the other end edge (edge which is drawing 2 and is located in the bottom) of this inside outer wall section 18a, in the condition of wrapping the peripheral face of the above-mentioned inside outer wall section 18a, is laid on top of the peripheral face of this inside outer wall section 18a, and is carrying out soldering junction while it plugs up the above-mentioned opening 17. Since other configurations and operations are the same as that of the case of the 1st example mentioned above, they omit the overlapping explanation. In addition, as well as the 1st example mentioned above when building flat heat exhanger tube 12a of this example, the above-mentioned corrugated plate section 13a is formed in the metal plate of one sheet by roll forming. Thus, flat heat exhanger tube 12a as shown in drawing 2 is manufactured by bending the formed middle material which is not illustrated by roll forming.

[0016] Next, drawing 3 shows the 3rd example of the gestalt of the operation of this invention corresponding to claims 1 and 4. In flat heat exhanger tube 12b of this example, while constituting almost like the flat heat exhanger tube 12 of the 1st example which mentioned above the left half part of drawing 3 , the right half part is changed.

[0017] Flat heat exhanger tube 12b of this example is equipped with the first corrugated plate section 23 which continued crosswise [of a metal plate] and has been arranged mutually at the serial, first Taira Itabe 25, inside outer wall section 18b, a flat part 30, secondary wave Itabe 24, second Taira Itabe 26, the flat tubing-like first outside outer wall section 27, the bending section 19, and the second outside outer wall section 28. The above-mentioned first corrugated plate section 23 is formed in the crosswise end edge of the above-mentioned metal plate in the shape of a corrugated plate, and has two or more partition sections 14 and 14. Above-mentioned first Taira Itabe 25 makes the end edge (upper limit edge of drawing 3) follow the end edge (right end edge of drawing 3) of the above-mentioned first corrugated plate section 23. It is bent in the condition of on the other hand extending towards a side (inferior-surface-of-tongue side of drawing 3) to the cross direction (longitudinal direction of drawing 3) of this first corrugated plate section 23 from the one side side (top-face side of drawing 3) of this first corrugated plate section 23 in the almost right-angled direction (down [of drawing 3]). The above-mentioned inside outer wall section 18b makes the end edge (edge which is drawing 3 and is located in the bottom) follow above-mentioned first Taira Itabe's 25 other end edge (lower limit edge of drawing 3), the crosswise pars intermedia of the above-mentioned metal plate is bent to a cross-section U typeface, and it changes so that the above-mentioned first corrugated plate section 23 may be wrapped, and it has the opening 17 which carried out opening to the method of one side (method of right-hand side of drawing 3). The above-mentioned flat part 30 made that end edge (left end edge of drawing 3) follow the other end edge (edge which is drawing 3 and is located in the bottom) of the above-mentioned inside outer wall section 18b, and is prepared in the condition of extending straightly from this other end edge. Above-mentioned secondary wave Itabe 24 continues the above-mentioned first corrugated plate section 23 and crosswise [each], is stationed at a serial while he makes the end edge (right end edge of drawing 3) follow the other end edge (right end edge of drawing 3) of the above-mentioned flat part 30, and he has two or more partition sections 14 and 14. Above-mentioned second Taira Itabe 26 made that end edge (upper limit edge of drawing 3) follow above-mentioned secondary wave Itabe's 24 other end edge (left end edge of drawing 3), and it has bent in the condition of on the other hand extending towards a side (inferior-surface-of-tongue side of drawing 3) to this secondary wave Itabe's 24 cross direction from this secondary wave Itabe's 24 one side side (top-face side of drawing 3) in the almost right-angled direction. The above-mentioned first outside outer wall section 27 makes the end edge (edge located in the center-section left-hand side of drawing 3) follow above-mentioned second Taira Itabe's 26 other end edge (lower limit edge of drawing 3). In the condition of wrapping the above-mentioned inside outer wall section 18b, the above-mentioned flat part 30, and above-mentioned secondary wave Itabe 24, on the other hand (inferior surface of tongue which is drawing 3), the peripheral face of these inside outer wall section 18b, one side (top face of drawing 3) of a flat part 30, and secondary wave Itabe 24 piled up, and it would shine and has joined. The above-mentioned bending section 19 made that end edge (edge which is drawing 3 and is located in the bottom) follow the other end edge (edge located in the center-section right-hand side of drawing 3) of the above-mentioned first outside outer wall section 27, turned the crosswise pars intermedia of the above-mentioned metal plate to the peripheral face side of this first outside outer wall section 27, and has bent and laid it on top of the cross-section U typeface. The above-mentioned second outside outer wall section 28 makes that end edge (left end edge of drawing 3) follow the other end edge (edge which is drawing 3 and is located in the bottom) of this bending section 19, in the condition of wrapping a part of above-mentioned first outside outer wall section 27, is laid on top of the peripheral face of this first outside outer wall section 27, and is carrying out soldering junction.

[0018] moreover, inner fin section 10c -- above-mentioned every of the side faces of the above-mentioned first and second car corrugated plate sections 23 and 24, and the above-mentioned first and the second car monotonous sections 25 and 26 -- pile up mutually the side faces located in the opposite side of the first and secondary wave Itabe 23 and 24 — by obtaining and joining, formed septum section 16a is arranged to a serial, and it changes. Outer wall section 11c Moreover, the above-mentioned inside outer wall section 18b and the above-mentioned flat part 30, The above-mentioned first and second car outside outer wall sections 27

and 28 and the above-mentioned bending section 19, It constitutes from connector section 20a formed by comparing the periphery edge of the clinch section of this bending section 19, and the other end veranda (under drawing 3) front face of the side face in which it is located in the above-mentioned secondary wave Itabe 24 side of above-mentioned second Taira Itabe's 26 side faces, and carrying out soldering junction mutually. Since other configurations and operations are the same as that of the case of the 1st example mentioned above, the overlapping explanation is omitted. In addition, as well as the 1st example mentioned above when manufacturing flat heat exhanger tube 12b of this example, roll forming performs.

[0019]

[Effect of the Invention] Improvement in the heat transfer engine performance between flowing fluid can be aimed at for the interior, maintaining the corrosion resistance of the outer wall section, since the flat heat exhanger tube for heat exchangers of this invention is constituted as mentioned above and acts.

[Translation done.]

* NOTICES *

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] End view showing the 1st example of the gestalt of operation of this invention.
[Drawing 2] The same drawing as drawing 1 showing this 2nd example.
[Drawing 3] The same drawing as drawing 1 showing this 3rd example.
[Drawing 4] The abbreviation sectional view showing the process which manufactures the flat heat exhanger tube of the 1st example of the gestalt of operation of this invention.
[Drawing 5] The perspective view showing one example of a heat exchanger known from the former.
[Drawing 6] The partial perspective view showing the early stages of the production process of the conventional flat heat exhanger tube.
[Drawing 7] The partial perspective view showing the middle of a production process similarly.
[Drawing 8] The partial perspective view showing the telophase of a production process similarly.

[Drawing 9] The partial perspective view showing the conventional flat heat exhanger tube.
[Description of Notations]
1 1a Flat heat exhanger tube
2 Corrugated Fin
3 Core Section
4 Side Support
5 Inlet Pipe
6 Input-Side Header
7 Outlet Pipe
8 Outlet Side Header
9 Plate
10, 10a, 10b, 10c Inner fin section
11, 11a, 11b, 11c Outer wall section
12, 12a, 12b Flat heat exhanger tube
13 13a Corrugated plate section
14 Partition Section
15 Monotonous Section
16 16a Septum section
17 Opening
18, 18a, 18b Inside outer wall section
19 Bending Section
20 20a Connector section
22 22a Outside outer wall section
23 First Corrugated Plate Section
24 Secondary Wave Itabe
25 First Taira Itabe
26 Second Taira Itabe
27 First Outside Outer Wall Section

28 Second Outside Outer Wall Section
29 Middle Material
30 Flat Part

[Translation done.]

* NOTICES *

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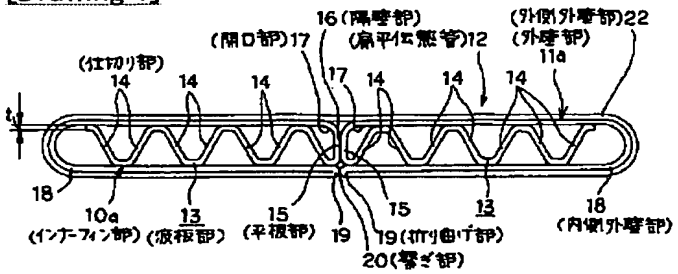
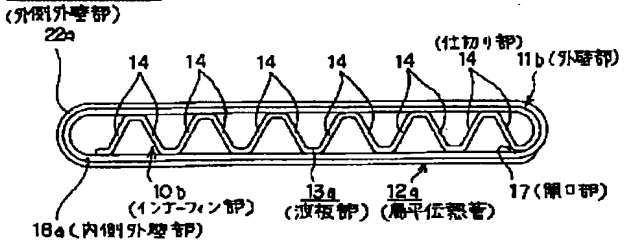
DRAWINGS

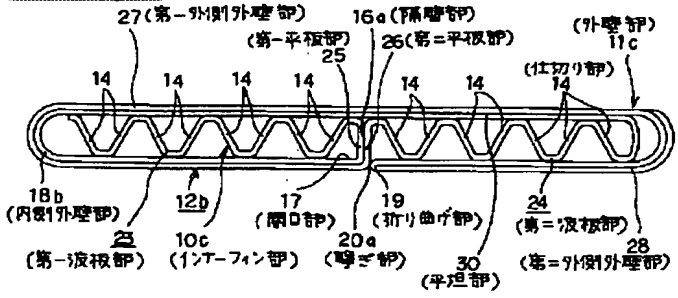
[Drawing 1]



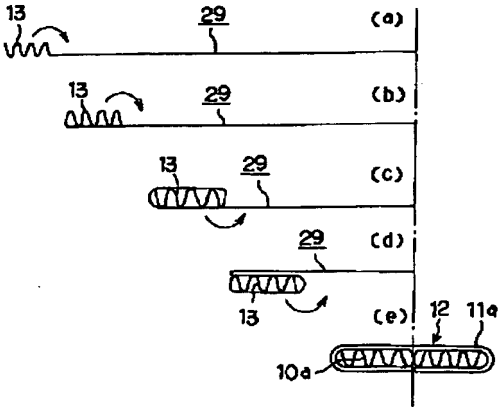
[Drawing 2]



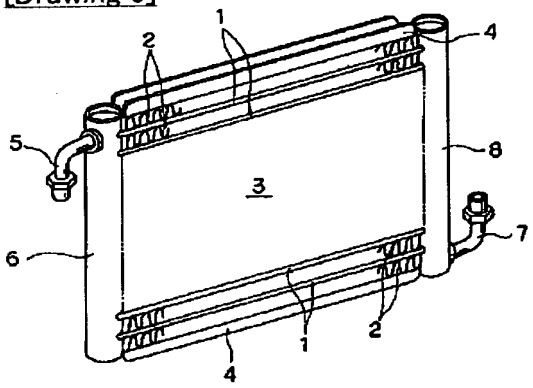
[Drawing 3]



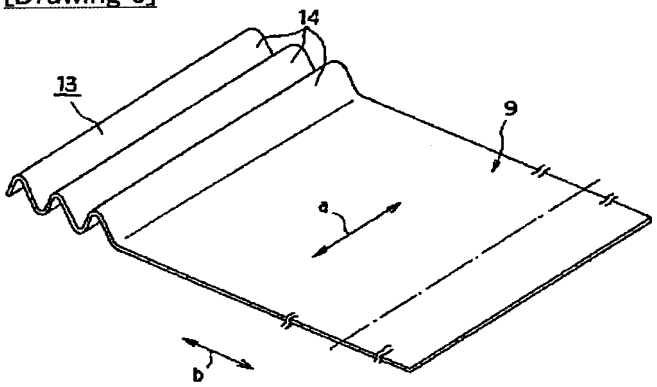
[Drawing 4]



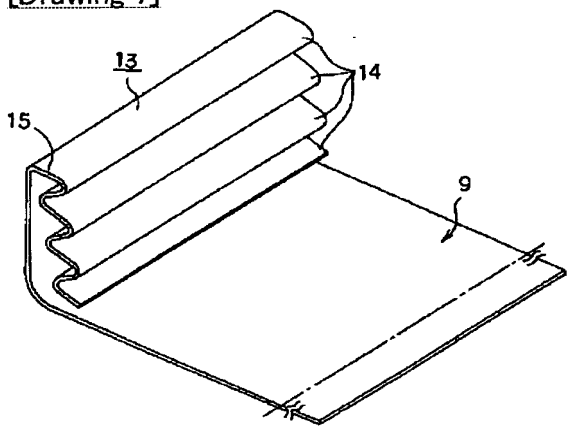
[Drawing 5]



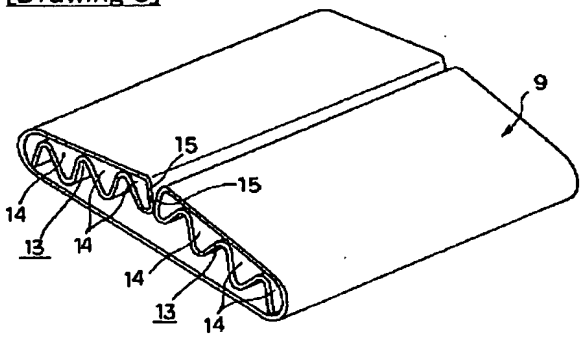
[Drawing 6]



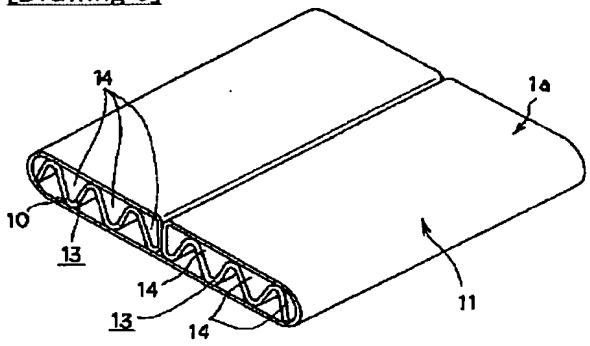
[Drawing 7]



[Drawing 8]



[Drawing 9]



[Translation done.]